THE ODONATA OF CAPE COD, MASSACHUSETTS[1]

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Comparatively few workers have studied the Odonata of Cape Cod. Such well-known odonatists as Hagen, Kellicott, and Calvert apparently collected a few dragonflies, but only Howe and Gray did any systematic collecting. A remnant of Gray's collection, which appears to have been limited to the Woods Hole region, is now in the museum of the Marine Biological Laboratory. His only published contribution (1937) concerned *Anax longipes.* Howe was the principal student of the Odonata of Cape Cod (and that of New England), but his collecting was limited to the eastern portion (Howe, 1920). His listing of New England records (Howe, 1917, 1918, 1917-21), however, brought together the available records, and his paper on distribution of New England Odonata (Howe, 1921) contains some pertinent ideas on Cape Cod.

During the summers of 1950 through 1953 the present authors made 115 collections at 55 localities on the Cape. Seventy-two species were found, of which nineteen are new for Cape Cod and two (*Enallagma recurvatum* and *Ladona deplanata*) are new to both Massachusetts and New England. Of those listed by other authors, we failed to collect thirteen species. This represents the only recorded systematic collection of Odonata covering the major part of Cape Cod.

As a faunal area, Cape Cod is interesting for several reasons. First, it is formed almost entirely of glacial moraine and outwash plain and, principally for this reason, represents the northernmost extension of

[1]Cape Cod is here defined as the isolated area from the Cape Cod Canal to the spit at Provincetown. This excludes a small triangle east of the Plymouth moraine which is influenced by streams from the mainland.

the Coastal Plain (Fenneman, 1938). Long Island is of very similar formation. From New Jersey southward the true Coastal Plain becomes broader, the fall line marking approximately its inner boundary. Second, Cape Cod marks the most southerly terminus of the second and last substage of the Wisconsin glacier (Woodworth and Wigglesworth, 1934). Thus the species inhabiting it must have become established since the last retreat, a gradual succession of faunas with differing temperature and habitat requirements doubtless having occurred as the climate became warmer. Third, the surrounding ocean, due to the influence of the cold Labrador current and the warm Gulf Stream, is a region of crowded isotherms, causing a faunal break which may be reflected on the land.

From these factors, it might be expected that Cape Cod would be a meeting place of northern and southern forms, and that, due to the coastal plain habitat, the southern would predominate. Northern species may be those at the margin of their range which can tolerate certain more favorable habitats, may have become established by accident, or may be relict populations. Southern species, although marginal, are doubtless entirely immigrants which are expanding their range northward. Howe (1921) records 58 species from Cape Cod, of which 39 are of southern affinities. In his Manual (1917-21), however, 69 species are recorded from Cape Cod, of which 46 are southern. Of the 72 species collected by the present authors, 46 are southern. Howe (1921) stated that the moraine which extends from near Plymouth to Woods Hole was the only faunal barrier in New England. He may have believed that this low line of hills was effective in preventing many New England species from invading Cape Cod. In support of this he listed 28 species whose ranges ended abruptly at the moraine. We have collected eighteen of these on Cape Cod, and of them only *Pantala flavescens* appears to be transient. Most were breeding populations. Of the remaining ten, four river-inhabiting species of northern affinities would be hard-put to find suitable streams, and three more species are recorded by Howe, himself, in his Manual (1917-21). The moraine might be considered a barrier, but only in the sense that it demarcates a type of habitat distinct from the rest of New England, but similar to the Coastal Plain of Long

Island and New Jersey. Evidence of this is the occurrence, predominantly on the Coastal Plain, of several comparatively rare species, such as *Enallagma laterale* and *Ischnura kellicotti,* which have been found on the Cape and Long Island (Davis, 1913; Thomas W. Donnelly, pers. comm.), and *Enallagma recurvatum* and *pictum,* which have been found in New Jersey (Beatty, 1945, 1946) as well. It must be admitted that, of these, *Enallagma recurvatum* alone has been taken *only* in Coastal Plain; the others have been found sparingly in other places. The northern Coastal Plain nevertheless seems to be their center of distribution.

There are five general habitat types suitable for Odonata on Cape Cod. The most prominent are the kettle holes, formed by deposition of glacial outwash material about unmelted blocks of ice. These and a few depression ponds will be designated as ponds. The large lakes, which may be very large kettles, depressions, or former coves, form a different habitat. A few bogs, some small streams, and many brackish water areas occur. Some species appear confined to a given habitat. *Argia mœsta, Enallagma exsulans, Dromogomphus spinosus,* and *Epicordulia princeps* were found only in large lakes, possibly requiring the greater wave action which occurs or the greater amount of oxygen due to comparative lack of organic detritus and to better mixing. These are commonly stream species. *Agrion maculatum, Amphiagrion saucium,* and *Sympetrum semicinctum* occurred only near running water. Kettle holes showed all stages in transition from sandy-bottomed ponds to true bogs. Several species with bog affinities, therefore, were found also in boggy portions of ponds. Bog species were *Enallagma cyathigerum, Nehalennia gracilis, Gomphaeschna furcillata, Dorocordulia lepida, Libellula quadrimaculata,* and *Nannothemis bella.* Since all these are northern species, the relative constancy of the bog habitat may permit their survival southward. *Erythrodiplax berenice* and *Libellula needhami* were taken only near brackish water habitat. Many species had very limited distributions even within a habitat type, often occurring in widely separated areas. This was noticeably true of *Enallagma recurvatum, laterale,* and *pictum,* which occurred in only a few ponds of the great number. Others were nearly cosmopolitan, occurring widely in one or more habitats.

One climatic factor seems important enough to be mentioned. Rainfall in the spring of 1953 was apparently quite heavy, for the water level in all the ponds previously visited was approximately a foot and a half higher than normal. Even when collecting was ended, in early August, the levels were still well above normal. This was accompanied by a marked absence of several species which had formerly been locally common. *Leucorrhinia frigida* was a notable example. At Flashy Pond it had previously been extremely common, the exuviae covering the emergent rush stems. In 1953 only four were caught in four trips. Since the normally emergent vegetation was covered, perhaps there were not enough places to allow the nymphs to transform. The same was true for *Celithemis elisa* and *martha* and *Lestes disjunctus* and *forcipatus* at Flashy Pond.

DESCRIPTION OF LOCALITIES

The names given in the following descriptions are those found on the U. S. Geological Survey topographic maps. No attempt is made to name ponds not named on these sheets.

Larger lakes. These are usually both larger and deeper than those designated as ponds. They are sandy to the shore line, seldom with boggy edges, and are often populated with sport fishes. Blue flag (*Iris versicolor*) occurred in the marginal water, but was never seen on a small pond. Water lobelia (*Lobelia dortmanna*) and swamp candle (*Lysimachia terrestris*) were also common emergents, but were found in some of the ponds which had sandy margins. All except Oyster Pond are described in the Massachusetts Fisheries Report for Barnstable County (1951).

1. Ashumet Pond. Mashpee and Falmouth Townships. A smaller pond connected to it by a narrow ditch at high water will be distinguished in the species accounts. Eleven collections. June 10-July 30, 1953.

2. Lawrence Pond. Sandwich Township. July 25, 1953.

3. Oyster Pond. Falmouth Township. Slightly brackish at least in places, having at one time been a cove. This is quite a different

habitat than the other lakes, partly because the margins slope steeply, thus allowing no gradual transition of littoral zones. Visited, but not collected, on several occasions. Collected June 15, 1953.

4. Snake Pond. Sandwich Township. July 25, 1953.

5. Wakeby Pond. Mashpee Township. July 25, 1953.

Ponds. These are generally small in size, but a few reach several acres in area. They usually have at least some accumulation of peat and initiation of bog formation at the edges. Commonly they have a heavy accumulation of organic debris. *Nymphæa, Utricularia, Scirpus,* and *Juncus* are common plants.

6. Deep Pond. Falmouth Township. July 27, 1951.

7. Deer Pond. Falmouth Township. June 18, 1953. Deeper than most. A heavy population of bullheads (*Ameiurus nebulosus*).

8. Duck Pond. Barnstable Township. About a mile west of Hyannis airport. June 13, 1953.

9. Elisha Pond. Yarmouth Township. August 22, 1951.

10. Emery Pond. Chatham Township. August 23, 1951.

11. Flashy Pond. Mashpee Township. Twelve collections in 1951-1953, June 10-August 24. An extremely productive small pond to which special attention was given.

12. Flax Pond. Bourne Township. Near Barnstable County Sanitorium. Nine collections in 1950-1953, June 6-September 2. Now being called "Picture Pond."

13. Flax Pond. Falmouth Township. Part of L. W. Francis Estate in Quisset. Four collections in 1951 and 1953, June 9-August 2.

14. Fresh Pond. Barnstable Township. About a half mile west of Hyannis airport. July 15, 1951. Very little water at time visited.

15. Grassy Pond. Falmouth Township. Just south of Ashumet Pond. June 25, 1951.

16. Greenough Pond. Yarmouth Township. August 22, 1951.

17. Hawksnest Pond. Harwich Township. Three collections in 1951 and 1953, June 25-August 4. Good bog development at one end, sandy beach at other.

18. Unnamed Pond. Brewster Township. In deep depression northeast of Sheep Pond. August 4, 1951.

19. Horse Pond. Yarmouth Township. August 22, 1951.

20. Unnamed Pond. Barnstable Township. About a mile northeast of Hyannis airport. June 13, 1953. Almost a bog.

21. Martha Pond. Mashpee Township. June 29, 1951.

22. Mary Dunn Pond. Barnstable Township. About a mile north of Hyannis airport. July 15, 1951.

23. Miles Pond. Falmouth Township. On Sippewisset Road. June 11, 1953. Used by Cahoon's Ice Plant. Edges drop off abruptly.

24. Jabinette's Pond. Yarmouth Township. Three collections in 1951 and 1953, June 13-July 15. Well-developed bog areas as well as sandy beach. Sunfish (*Lepomis gibbosus*) very common.

25. Mill Pond. Harwich Township. At east end of Long Pond. August 4, 1951.

26. Unnamed Pond. Mashpee Township. Just south of John's Pond. Two collections on September 4, 1951 and June 29, 1952. Very small, often with no standing water in late summer.

27. Unnamed Pond. Chatham Township. Southwest of Lovers Lake. August 23, 1951.

28. Randall Pond. Falmouth Township. Two collections on July 17, 1952 and June 24, 1953.

29. Unnamed Pond. Falmouth Township. At Old Silver Beach. Three collections in 1950 and 1951, June 17-September 2.

30. Sols Pond. Falmouth Township. June 15, 1953.

31. Spectacle Pond. Falmouth Township. August 23, 1951.

32. Unnamed Pond. Mashpee Township. Southeast of John's Pond. Three collections in 1950, 1951, and 1953, June 29-September 4. Quite boggy at the edges.

33. Twinings Pond. Orleans Township. In most southeasterly portion of township. August 22, 1951.

34. Walker's Pond. Harwich Township. August 4, 1951.

35. Weeks Pond. Sandwich Township. July 25, 1953.

36. Unnamed Pond. Falmouth Township. In woods north of Ransom Road. Locally called Whittemore Pond. Five collections in 1951 and 1953, June 11-August 4. *Myriophyllum, Nymphæa,* and *Brasenia* are abundant plants.

Bogs. Only two localities were visited which could be called definitive bogs. Both have quaking bottoms, but otherwise present different aspects.

37. Woods Hole Cedar Bog. Falmouth Township. Six collections in 1951-1953, June 8-July 25. Largely shaded by cedars and has an abundance of *Sphagnum.* A deep bog lake is surrounded by *Decadon* and *Andromeda.*

38. Gifford Bog. Falmouth Township. Just west of Long Pond. Five collections in 1952 and 1953, June 15-August 20. An *open* bog with *Juncus, Vaccinium* (a highbush blueberry), and *Rhexia* around the edges and *Sagittaria* and *Xyris* on slightly emergent islands. *Nymphæa* and *Utricularia* occur in open water.

Streams and running water. All but Silver Spring Brook are associated with cranberry bogs above the collected areas and have sandy bottoms. All are fairly small, no large freshwater streams occurring on Cape Cod.

39. Silver Spring Brook. Wellfleet Township. At Austin Ornithological Research Station. July 21, 1951.

40. Coonamessett River. Falmouth Township. North of Great Pond at highway 151 crossing. Two collections on July 7, 1951 and June 8, 1953.

41. Mills River. Barnstable Township. Just south of Mill Pond. July 15 and August 22, 1951. This includes an extensively widened portion, much like a pond, with a heavy accumulation of detritus.

42. Quashnet River. Mashpee Township. At highway 151 crossing. July 1, 1951.

43. Mashpee River. Mashpee Township. At highway 151 crossing. July 7, 1951.

Brackish habitat. The Odonata collected here may not spend their nymphal life in brackish water, but the abundance of some species and the lack of completely fresh water point to this condition.

44. Eastham tidal beach. Eastham Township. Mud flat on inner bay. July 21, 1951.

45. Nauset Bay. Eastham Township. August 18, 1951.

46. Tidal marsh off Eel Pond, Woods Hole. Falmouth Township. Two collections on June 30, 1951 and July 26, 1953.

47. Sippewisset Beach. Falmouth Township. On Buzzard's Bay. Three collections in 1951 and 1953, July 4-26. A small freshwater pond is also present.

Other localities. These cannot be classified as any of the previous habitat types, but may be located near such areas.

48. Wet meadow in dry bed of Childs River. Mashpee Township. Just south of John's Pond. Two collections on June 29 and July 11, 1951.

49. Road west of Elbow Pond. Brewster Township. August 4, 1951.

50. Ponds of Sandwich Fish Hatchery. Sandwich Township. July 19, 1952.

51. Goodwill Park. Falmouth Township. Near Long Pond. July 10, 1952.

52. Sippewisset Road, Quisset. Falmouth Township. Near Flax Pond of L. W. Francis estate. July 30, 1952.

53. Telegraph Hill. Sandwich Township. July 25, 1953.

54. Cultivated cranberry bog near Wing Pond. Falmouth Township. July 9, 1952.

55. Woods Hole. Falmouth Township. July 26, 1951.

LIST OF SPECIES

The dates recorded are the earliest and latest on which we have caught or positively identified the species. Since our own extreme dates are June 6 and September 4, and since all areas were not given seasonal coverage, our collecting does not necessarily indicate the season on many species.

Suborder Zygoptera

Family Agrionidæ

Agrion maculatum Beauvais. Loc. 41, 42, 43. July 1-August 22. Restricted to running water. Common at Mills River.

Hetaerina americana (Fabricius). Reported by Howe (1917-21).

Family Lestidæ

Lestes congener Hagen. Loc. 35. July 25, 1953. One male.

Lestes disjunctus Selys. Loc. 1(pond), 9, 11, 12, 14, 16, 17, 32, 33, 35, 37, 38. July 1-August 24. Walker (1952) believed that southern New England would be an area of intergradation between the subspecies *d. disjunctus* and *d. australis*. Our forms appear referable to the subspecies *disjunctus* and show no intergradation.

Lestes forcipatus Rambur. Loc. 1(pond), 9, 11, 13, 14, 26, 28, 32, 35, 36, 38, 48. June 15-August 24. In accordance with Walker's (1952) observations, we collected *forcipatus* earlier than *disjunctus* in this region where both species are common.

Lestes inequalis Walsh. Loc. 28. June 24, 1953. One male. First Cape Cod record

Lestes eurinus Say. Loc. 8, 11, 15, 21, 32, 38. June 10- July 27.

Lestes rectangularis Say. Loc. 9, 11, 13, 17, 21, 35, 36, 37, 38, 41. June 29-August 22.

Lestes dryas Kirby. Recorded by Howe (1917-21).

Lestes unguiculatus Hagen. Loc. 1(pond). June 29, 1953. One male.

Lestes vigilax Hagen. Loc. 1(pond), 8, 10, 11, 12, 13, 16, 17, 18, 20, 22, 24, 25, 27, 29, 33, 36, 37, 39. June 13-September 2.

Family Cœnagrionidæ

Argia mœsta (Hagen). Loc. 1(lake), 2, 4, 5. June 20-July 30. Collected only at large lakes.

Argia violacea (Hagen). Loc. 4, 9, 13, 17, 18, 23, 24, 25, 28, 31, 35, 36, 40, 41, 51. June 11-August 24.

Enallagma aspersum (Hagen). Loc. 1(pond), 11, 12, 14, 20, 24, 32, 35, 36. June 10-August 6. Taken only in company with other *Enallagmas,* and always outnumbered by at least one of these species.

Enallagma civile (Hagen). Loc. 1(lake), 2, 3, 4, 5, 47. June 10-July 30. Collected only on large lakes except for Sippewisset Beach, where it was abundant.

Enallagma doubledayi Selys. Loc. 1(pond), 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 20, 22, 24, 25, 27, 32, 33, 34, 35, 36, 37, 38. June 6-August 24. The most abundant damselfly on the Cape. At Ashumet Pond, where the similar species *E. civile* was common on the lake, *doubledayi* occurred only in the adjoining pond. Neither was collected in the other habitat. This contrasts with the observations of Beatty (1945, 1946), who found them flying together in New Jersey.

Enallagma cyathigerum (Charpentier). Loc. 38. June 15 and 24, 1953. Pairs were seen in tandem, indicating a probable permanent breeding population.

Enallagma durum (Hagen). Reported by Calvert (1894).

Enallagma exsulans (Hagen). Loc. 1(lake), 4, 5. June 19-July 30. Found on large lakes only.

Enallagma geminatum Kellicott. Loc. 9, 13, 16, 17, 24, 25, 28, 33, 35, 36, 38, 39. June 20-August 22. First Cape Cod record. Seldom numerous.

Enallagma hageni (Walsh). Loc. 11. June 17, 1951. One male. First Cape Cod record.

Enallagma laterale Morse. Loc. 17, 24, 38. June 13-25. First Cape Cod record. Abundant around the edge of Jabinette's Pond on June 13, 1953. Pairs in tandem were taken, representing the first females on record. These will be described elsewhere. On June 25 none could be found here. This species apparently has a widespread, but local distribution. It has been taken in Massachusetts

(Morse, 1895; Howe, 1916), Indiana (Muttkowski, 1910), Maine (Borror, 1940) and New York (Davis, 1913; Donnelly, pers. comm.). Early spring collecting will probably show it to be far more common on Cape Cod, though with a short flying season.

Enallagma minusculum Morse. Loc. 1(lake), 2, 4, 7, 12, 17, 22, 24, 27. June 10-August 23. Probably the most common early damselfly, becoming less so later.

Enallagma pictum Morse. Loc. 17, 25, 28, 36. July 11-August 4. First Cape Cod record. Common at Hawksnest Pond after mid-July. This species preferred to remain near lily pads, either resting on them or flying a short distance above them. It was never seen close to the shore line, whereas other *Enallagmas* with it were commonly found in the rushes or on the shrubby edge.

Enallagma recurvatum Davis. Loc. 12, 15, 17, 24. June 13-25. First Cape Cod and New England record. Like *laterale* this seems to be an early spring species with a short flying season. Abundant around Flax (Picture) Pond on June 16, 1953. Ten days previously none were found. The species has been collected on Long Island (Davis, 1913; Donnelly, pers. comm.) and in New Jersey (Beatty, 1945, 1946). Thus it seems limited to sandy, coastal plain habitat. Early collecting may reveal it farther south.

Enallagma signatum (Hagen). Loc. 3. 13, 16, 18, 24, 27, 36, 39. June 15-August 22.

Enallagma vesperum Calvert. Loc. 1(lake), 4, 13, 17, 18, 25, 27, 36. July 21-August 23. First Cape Cod record.

Nehalennia gracilis Morse. Loc. 37, 38. June 6-July 25. First Cape Cod record. Found only in bogs. Very abundant at Woods Hole Cedar Bog.

Nehalennia irene Hagen. Reported by Howe (1917-21, 1920).

Amphiagrion saucium (Burmeister). Loc. 40, 41, 43. June 8-July 15. First Cape Cod record. Restricted to streams.

Ischnura kellicotti Williamson. Loc. 17, 24, 33, 36. June 20-August 22. First Cape Cod record. Common at Jabinette's Pond on July 15, 1951, but not seen at two earlier dates in 1953. Besides males, only orange females have been seen. This seems to be

another widespread species with local distribution. It has been recorded from Indiana (Williamson, 1898), Rhode Island (Needham and Heywood, 1929), Long Island (Donnelly, pers. comm.), New Jersey (Calvert, 1898), North Carolina (Westfall, 1942), and Florida (Davis and Fluno, 1938; Westfall, 1941).

Ischnura posita (Hagen). Loc. 1(pond), 8, 13, 16, 24, 33, 36, 37, 38, 39, 40, 41, 42. June 6-August 22.

Ischnura ramburii Selys. Recorded by Howe (1917-21).

Ischnura verticalis (Say). Loc. 1(pond), 8, 11, 12, 13, 14, 15, 16, 17, 20, 22, 24, 25, 27, 28, 29, 30, 31, 33, 35, 36, 37, 38, 39, 40, 41, 47, 48. June 6-August 24.

Chromagrion conditum (Hagen). Recorded by Howe (1917-21).

Anomalagrion hastatum (Say). Loc. 36. August 2, 1951. One male.

Suborder Anisoptera

Family Gomphidæ

Gomphus abbreviatus Hagen. Recorded by Hagen (Selys, 1878).

Gomphus exilis Selys. Loc. 1(lake), 11, 12, 17, 23, 40, 51, 54. June 10-July 10. A large emergence occurred at Ashumet Pond on June 10, 1953. On the following day, only one specimen was found. Not uncommon on the Cape.

Gomphus spicatus Hagen. Recorded by Howe (1922).

Dromogomphus spinosus Selys. Loc. 1, 5. June 29-July 25. Common at Ashumet Pond during emergence in late June, when many exuviæ were found on emergent vegetation and tenerals were found in the surrounding scrubby woods. Probably common on large lakes.

Progomphus obscurus (Rambur). Recorded by Howe (1920, 1917-21).

Family Aeschnidæ

Anax junius (Drury). Loc. 1(both), 11, 12, 13, 15, 17, 20, 22, 24, 25, 26, 28, 29, 30, 32, 33, 36, 37, 38, 39, 47, 48. June 6-September 4.

Anax longipes Hagen. Loc. 11, 13, 22. June 19-August 6. This

seldom-caught species is apparently locally common on the Atlantic Coastal Plain. Many authors have reported it from the United States from Mississippi and Florida to Massachusetts and inland to Ohio and Indiana. Hagen (1884) and Gray (1937) have previously recorded it from Woods Hole. At Flashy Pond we often saw five or six in a day. We took three males, one with a shotgun, one knocked into the water by another male, and a third by net. Our single female, with abdomen similar in color to that of females of *A. junius,* was taken while ovipositing alone. The females seem to be dimorphic, as one individual with a brick-red abdomen was observed, apparently ovipositing. Unlike *junius,* they lay their eggs in the absence of the male.

Boyeria vinosa (Say). Recorded by Howe (1922).

Basiaeschna janata (Say). Loc. 1(lake). Two males on June 10 and 11, 1953. First Cape Cod record.

Gomphaeschna furcillata (Say). Loc. 37. June 8, 1953. Another Woods Hole record, possibly from the same bog, is recorded by Gloyd (1940, p. 3), which is the first Cape Cod record.

Aeshna canadensis Walker. Loc. 10, 11, 33, 55. July 26-August 23. First Cape Cod record.

Aeshna clepsydra Say. Loc. 9, 11, 27, 32, 33, 38. August 6-September 4.

Aeshna tuberculifera Walker. Loc. 38, 52. July 30-August 20. This species was abundant hawking along a short stretch of Sippewisset Road in the evening of July 30, 1952, but was not seen there again.

Aeshna umbrosa Walker. Recorded by Howe (1917-21, 1920).

Aeshna verticalis Hagen. Recorded by Howe (1917-21).

Family Corduliidæ

Didymops transversa (Say). Loc. 11. June 10, 1953. A mating pair. First Cape Cod record.

Macromia illinoiensis (Say). Loc. 1(lake), 51, 53. July 4-25. Exuviae found at Ashumet Pond.

Epicordulia princeps (Hagen). Loc. 1, 2, 5, 47, 49. June 26-August 4 A very large emergence occurred at Ashumet Pond during the last week in June. Hundreds of exuviae were found clinging to emerg-

ent vegetation; yet even in the surrounding woods, adults were uncommon.

Tetragoneuria cynosura (Say). Loc. 1, 11, 13, 24, 37, 51. June 6-July 10. No attempt is made to distinguish the subspecies *cynosura* from *simulans;* their status as subspecies arouses considerable doubt.

Dorocordulia lepida (Hagen). Loc. 11, 17, 24, 37, 38. June 15-July 7. Found at bogs or quite boggy ponds.

Family Libellulidæ

Libellula auripennis Burmeister. Loc. 1(pond), 11, 12, 13, 14, 17, 24, 28, 29, 32, 35, 36, 38. June 10- September 4. Common at ponds.

Libellula needhami Westfall. Loc. 46, 47. June 30-August 2. This species, only recently distinguished from *auripennis* (Westfall, 1943), was found only near salt water, whereas *auripennis* was common, but only at inland ponds. Westfall's records show very few *needhami* from localities far from the coast except in Florida. *Auripennis,* however, seems to be found both inland and coastally. Perhaps the habitat segregation on Cape Cod is indicative of factors which led to their speciation and to which each is adapted.

Libellula cyanea Fabricius. Loc. 1(pond), 11, 13, 24, 28, 29, 32, 35, 38, 39, 40, 41, 46, 50, 51, 54. June 10-September 2.

Libellula incesta Hagen. Loc. 1(pond), 6, 9, 11, 12, 13, 17, 24, 25, 28, 31, 32, 33, 34, 36, 39, 51. June 25-August 24. An examination of the penes of several specimens thought to be *vibrans,* as based on color characters, showed only this species.

Libellula vibrans Fabricius. Recorded by Kellicott (1884) and Howe (1917-21). Probably refers to *L. incesta.*

Libellula luctuosa Burmeister. Loc. 3, 47, 51. July 10-July 26. Uncommon. Collected only on July 10, 1952 at Goodwill Park, Falmouth.

Libellula pulchella Drury. Loc. 1(pond), 11, 12, 13, 14, 26, 29, 35, 37, 38, 39, 40, 41, 43, 46, 47, 50, 54. June 6-September 4.

Libellula quadrimaculata Linne. Loc. 37, 38, 40. June 6-June 15. All but one specimen came from bogs.

Libellula semifasciata Burmeister. Loc. 37, 38, 46. June 6-July 26. Uncommon.

Ladona exusta (Say). Loc. 1(pond), 11, 12, 20, 24, 28, 29, 30, 32, 36, 37, 38, 40. June 6-July 4.

Ladona deplanata (Rambur). Loc. 1(pond), 7, 8, 11, 12, 14, 20, 24, 32. June 10-July 17. This represents a northward extension of the range of this species and a first record for Cape Cod and New England. A cursory study of Ladona *exusta, deplanata,* and *julia* has convinced us that *exusta* and *deplanata* are definitely good species, and that *julia* probably is also. The distal end of the penis (median lobes) of *deplanata,* as seen from the side, is concave, with extended ends. That of *exusta* is convex and not at all extended. The abdomen of adult *exusta* becomes white-pruinose, the dorsum of the thorax becoming gray or not at all pruinose. *Deplanata* becomes uniformly gray-pruinose on thorax and abdomen. All the *exusta* studied had the supratriangle of the fore wing crossed, while only about a quarter of the *deplanata* had such a crossvein. The dark basal markings of the wings are generally smaller and divided by a clear streak in *deplanata,* but this is not constant. *Julia* seems closer to *exusta,* the penis being convex distally, but the lobes extending more. The abdomen becomes white-pruinose only on the anterior segments, and the dorsum of the thorax becomes white. The supratriangle is crossed, and the wing markings are small, but without the clear streak of *deplanata.*

Plathemis lydia (Drury). Loc. 11, 14, 28, 32, 37, 38, 40, 41, 46, 54. June 8-August 24.

Perithemis tenera (Say). Loc. 9, 16, 17, 25, 29, 33, 39. July 1-August 22. Never common.

Nannothemis bella (Uhler). Loc. 38. July 4, 1952. Two males, one female.

Erythrodiplax berenice (Drury). Loc. 14, 39, 44, 45, 47. June 30-August 6.

Erythemis simplicicollis (Say). Loc. 1(pond), 4, 6, 8, 11, 12, 13, 14, 17, 20, 21, 22, 25, 28, 29, 30, 32, 33, 35, 36, 37, 38, 39, 41, 46, 47, 50, 51. June 10-September 4.

Pachydiplax longipennis (Burmeister). Loc. 11, 13, 25, 28, 29, 32, 37, 38, 39. June 15-September 2.

Sympetrum corruptum (Hagen). Recorded by Howe (1917-21).

Sympetrum costiferum (Hagen). Recorded by Howe (1917-21).

Sympetrum obtrusum (Hagen). Recorded by Howe (1917-21).

Sympetrum rubicundulum (Say). Loc. 1(pond), 9, 11, 13, 14, 17, 21, 22, 24, 25, 26, 28, 29, 32, 34, 35, 37, 38, 50, 51. June 29-September 2.

Sympetrum semicinctum (Say). Loc. 11, 39, 41. July 15-August 22. First Cape Cod record. Seems to prefer the vicinity of running water.

Sympetrum vicinum (Hagen). Loc. 9, 10, 11, 16, 17, 19, 25, 31, 32, 33, 35, 36, 41. August 4-24.

Leucorrhinia intacta (Hagen). Loc. 1(pond), 17, 20, 24, 37, 38. June 6-25.

Leucorrhinia frigida (Hagen). Loc. 11, 15, 22, 29. June 10-July 27. Abundant at Flashy Pond in 1951 and 1952; scarce in 1953.

Celithemis elisa (Hagen). Loc. 1(pond), 2, 4, 7, 9, 11, 12, 13, 15, 17, 19, 20, 21, 22, 24, 26, 27, 30, 31, 32, 33, 34, 35, 36, 38, 39, 51. June 10-August 24.

Celithemis eponina (Hagen). Loc. 10, 25, 33. August 4-23.

Celithemis martha Williamson. Loc. 1(pond), 9, 11, 12, 13, 14, 17, 25, 31, 32, 33, 35, 40, 43, 48. June 25-September 2. First Cape Cod record. On July 1, 1951, this species had emerged in numbers at Flashy Pond. The height of the breeding season here was around August 6, when great numbers of tandem pairs were seen. Males retained a hold on the female as she dipped her abdomen to lay eggs. July 30 was the height of emergence at the small pond adjoining Ashumet Pond in 1953. A series of nymphs was collected here.

Celithemis ornata (Rambur). Recorded by Howe (1917-21, 1920). This is probably *C. martha.*

Celithemis monomelaena Williamson. Loc. 9. One male, another seen. First Cape Cod record.

Pantala flavescens (Fabricius). Loc. 45. August 18, 1951. One male, probably a transient. First Cape Cod record.

Tramea carolina (Linne). Loc. 1(pond), 8, 11, 12, 13, 17, 35, 48, 52. June 10-August 6.

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